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IS 3222-1 (1989): Instrument Screws, Part 1: Fasteners for Drawing Instruments [PGD 22: Educational Instruments and Equipment]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard
INSTRUMENT SCREWS — SPECIFICATION

PART 1 FASTENERS FOR DRAWING INSTRUMENTS

(First Revision)

भारतीय मानक

उपकरणों के पेंच — विशिष्ट

भाग 1 ड्राइंग उपकरणों के बंधक

(पहला पुनरीक्षण)

UDC 621.88 : 744.342

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FOREWORD

This Indian Standard (Part 1) (First Revision) was adopted by the Bureau of Indian Standards on 15 September 1989, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by Light Mechanical Engineering Division Council.

Fasteners of various types, such as knurled nuts, T-bolts, threaded bushes and needle holders are used as components of drawing instruments, namely compasses, dividers and spring bows. It is considered necessary to lay down a specification in order to unify and rationalize the various sizes and types of fasteners used for drawing instruments.

This standard covers the requirements of miniature screws and other threaded fasteners used in the manufacture of engineers' drawing instruments. It is intended to cover other types of fasteners for instruments in subsequent parts of the standard.

This standard was originally published in 1966. This revision is based on the experience gained in the manufacture of drawing instruments and other developments in this field.

The main modifications are:

- a) Inclusion of one more type of knurled nut, and threads M1·6 has been modified as M1·7.
- b) Threads M1·6 on T-bolts has been modified as M1·7.
- c) Tolerance on threads of ϕd_2 of bushes has been modified from h_7 to g_7 .
- d) Needle holder for needle size 1·3, additional lengths (l_1) 8·5 and 9·5 has been included.

In the preparation of this standard, considerable assistance has been derived from the following standards issued by the Deutscher Normenausschuss (DIN):

- DIN 58520 : 1976 T-bolts for drawing instruments
- DIN 58521 : 1978 Knurled nuts for drawing instruments
- DIN 58551 : 1975 Centre screws for drawing instruments
- DIN 58552 : 1975 Bushings for drawing instruments
- DIN 58553 : 1979 Needle holders for drawing instruments

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off values should be the same as that of the specified value in this standard.

Indian Standard

INSTRUMENT SCREWS—SPECIFICATION

PART 1 FASTENERS FOR DRAWING INSTRUMENTS

(First Revision)

1 SCOPE

1.1 This standard (Part 1) specifies the general and dimensional requirements of knurled nuts, T-bolts, threaded bushes, needle holders and centre screws for drawing instruments.

2 REFERENCES

| <i>IS No.</i> | <i>Title</i> |
|---------------------------|---|
| IS 1367 (Part 5) : 1980 | Mechanical properties and test methods for set screws and similar threaded fasteners not under tensile stress |
| IS 1368 : 1987 | Dimensions for ends of parts with external ISO metric threads (<i>third revision</i>) |
| IS 1369 : 1982 | Dimension for screw thread runouts and undercuts (<i>second revision</i>) |
| IS 2614 : 1969 | Methods for sampling of fasteners (<i>first revision</i>) |
| IS 3403 : 1981 | Dimensions for knurls (<i>first revision</i>) |

3 MATERIAL

3.1 The material for the manufacture of knurled nuts shall be hard rolled brass or nickel silver or any other material as agreed upon between the manufacturer and the purchaser.

3.2 The material for the manufacture of T-bolts shall correspond to the property class 14H given in IS 1367 (Part 5) : 1980.

3.3 The material for the manufacture of threaded bushes shall be stainless steel, free-cutting steel; nickel silver or phosphor bronze.

3.4 The material for the manufacture of needle holders shall be stainless steel, free-cutting steel or nickel silver.

3.5 The material for the manufacture of centre screws shall be as follows:

- a) For threaded shanks — free-cutting steel or stainless steel, and
- b) For centre nuts—nickel silver or phosphor bronze.

4 DIMENSIONS

4.1 The dimensions for knurled nuts shall be as given in Table 1.

4.2 The dimensions for T-bolts shall be as given in Table 2.

4.2.1 Raised head T-bolts may be supplied by agreement between the purchaser and the supplier.

4.3 The dimensions for threaded bushes shall be as given in Table 3.

4.4 The dimensions for needle holders shall be as given in Tables 4 and 5.

4.5 The dimensions for centre screws shall be as given in Table 6.

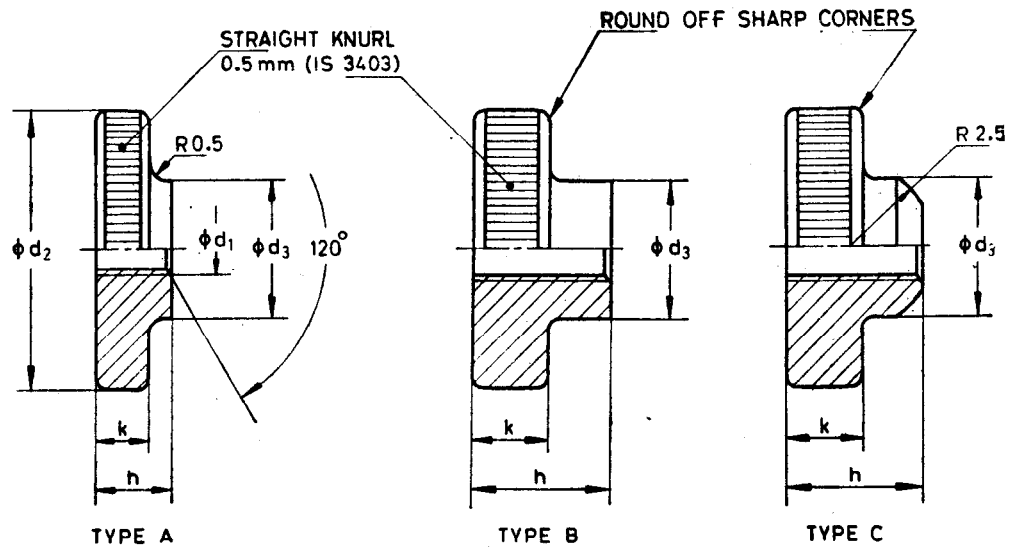
5 THREADS

5.1 All threads for knurled nuts, T-bolts, threaded bushes, needle holders and centre screws shall be metric threads with ISO profile as given in the relevant Indian Standard.

5.2 The threads shall conform to the tolerances as specified for normal grade as given in the relevant Indian Standard.

Table 1 Dimensions for Knurled Nuts
(Clause 4.1)

All dimensions in millimetres.



| Type | d_1 | d_2 $+0.2$ 0 | d_3 | h ± 0.1 | k |
|------|-----------|----------------------|-------|------------------|-----|
| A | M 1.4 | 7 | 4 | 2 | 1.5 |
| | | 8 | | 2.5 | 2 |
| | | 9 | | | |
| | | 10 | | | |
| | (M 1.7) | 8 | 4 | | |
| | | 9 | 4.5 | | |
| | M2 | 7 | 4 | | |
| | | 9 | 4.5 | | |
| B | M 1.4 | 7 | 3.5 | 3.5 | |
| | | 8 | 4 | 4 | |
| | M2 | 12 | 5 | | |
| C | M2 | 8 | 4 | | |

Designation:

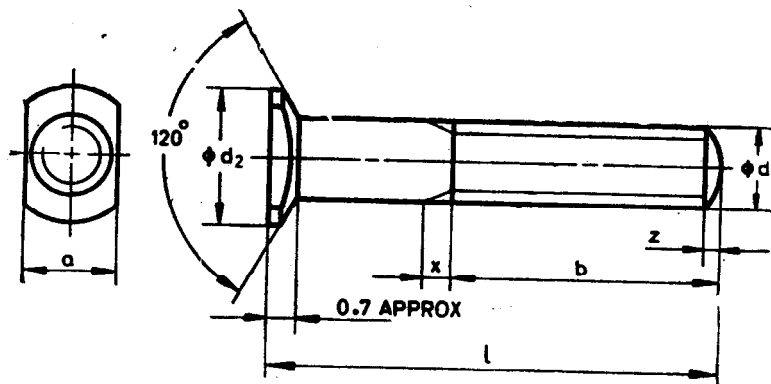
A knurled nut of Type A, having threads $d_1 = M1.7$, $d_2 = 4.5$, $d_3 = 9$ mm, $h = 2.5$ mm manufactured from nickel-silver (N_s) and polished, shall be designated as follows:

Knurled Nut A M1.7 × 4.5 × 9 × 2.5 IS 3222 N_s polished

Table 2 Dimensions for T-Bolts

(Clause 4.2)

All dimensions in millimetres.



z according to IS 1368 : 1980

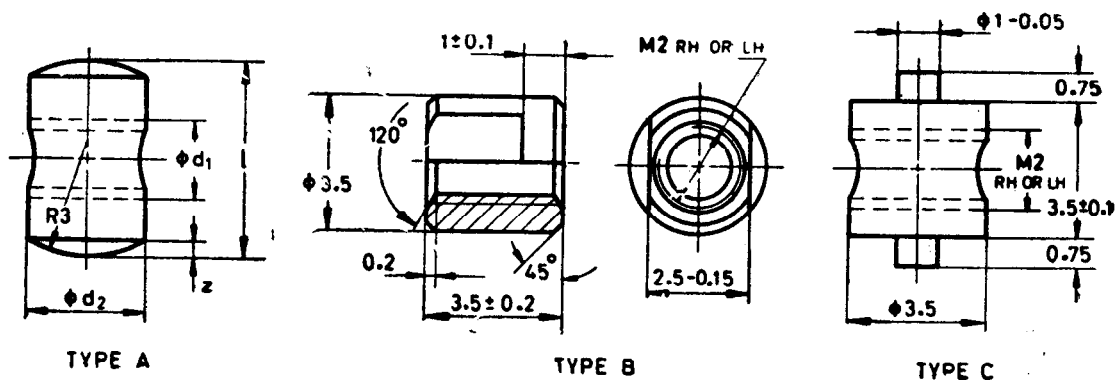
x according to IS 1369 : 1982

| d_1 | $\begin{matrix} l \\ 0 \\ -0.1 \end{matrix}$ | $\begin{matrix} a \\ Max \end{matrix}$ | b | d_1 |
|-------|--|--|-----|-------|
| M1.4 | 7 | 1.5 | 4.5 | 3 |
| | 8 | | 5.5 | |
| | 9 | | 6 | |
| | 10 | | 6.5 | |
| | 11 | | 7 | |
| M1.7 | 8 | 1.8 | 5.5 | 3 |
| | 9 | | 6 | |
| | 10 | | 6.5 | |
| | 11 | | 7 | |
| M2 | 11 | 2.1 | 7 | 3.5 |
| | 18 | | 13 | |
| | 25 | | 18 | |

Designation:A T-bolt with M1.4 threads, having length $l=8$ mm and nickel-plated shall be designated as follows:T-bolt M1.4 \times 8 IS 3222 Nickel-plated

Table 3 Dimensions for Threaded Bushes
(Clause 4.3)

All dimensions in millimetres.



z according to IS 1368 : 1980;

| l ± 0.1 | d_1 | d_2 $g7$ |
|------------------|---|---------------|
| 5 | M2 | 3 |
| 5.3 | M2LH | |
| 6 | M3 \times 1 (double start) M3 \times 1 LH (double start) | 4 |
| 7 | | 4.5 |
| 8 | | 4.5 |

Designation:

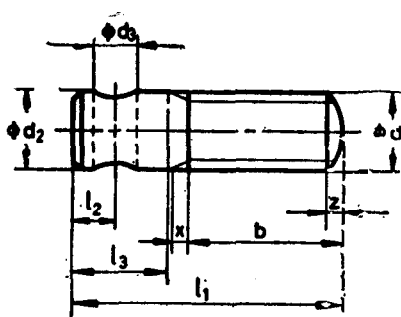
A pair of threaded bushes of Type A with length $l = 5$ mm, consisting of one bush with M2 right-hand threads and the other with M2 left-hand threads, made from free-cutting steel and polished, shall be designated as follows:

Threaded Bush Pair A5 M2 IS 3222 St polished

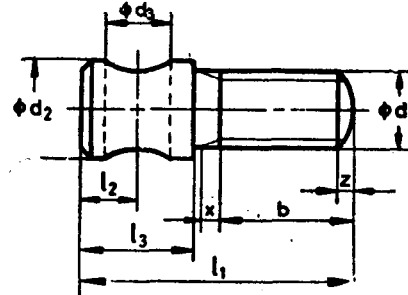
Table 4 Dimensions for Needle Holders, Types A and B

(Clause 4.4)

All dimensions in millimetres.



TYPE B



TYPE A

z according to IS 1368 : 1980

x according to IS 1369 : 1982

| For Needle Diameter | Type | d_1 | l_1 ± 0.1 | l_2 $+ 0.1$ 0 | l_3 0 $- 0.3$ | d_3 h9 | d_3 $+ 0.1$ 0 | b |
|---------------------|------|-------|--------------------|-----------------------|-----------------------|-------------|-----------------------|-----|
| 1 | A | M1.4 | 7 | 1.1 | | | 1.1 | 3.5 |
| | | | 8 | | | | | |
| 1.5 | | M2 | 7 | 1.4 | | | | 1.6 |
| | | | 9 | | 2.8 | 2.5 | | |
| | | | 8.5 | 2 | 4 | | | |
| | | | 9.5 | | | | | |
| 1 | B | M2 | 7 | 1.1 | 2.5 | 2 | 1.1 | 4 |
| | | | 8 | | 3.5 | | | |

Designation:

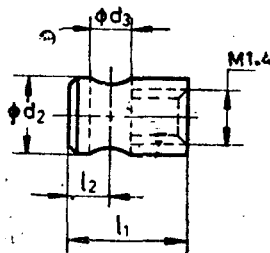
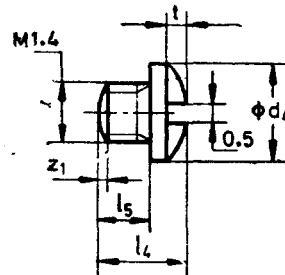
A needle holder of Type A with M1.4 threads, having length $l_1 = 7$ mm, made from nickel silver (Ns) and polished, shall be designated as follows:

Needles Holder A M1.4 \times 7 IS 3222 Ns Polished

Table 5 Dimensions for Needle Holders, Type C

(Clause 4.4)

z according to IS 1368 : 1980

NEEDLE HOLDER
BUSHNEEDLE HOLDER
SCREW

| Size | d_2 h9 | d_3 $+0.1$ 0 | l_1 | l_2 $+0.1$ 0 |
|------|-------------|----------------------|-------|----------------------|
| 1 | 2 | 1.1 | 3 | 1.1 |
| 2 | 2.5 | 1.6 | 3.8 | 1.4 |

| Size | d_4 | l_4 $+0.1$ 0 | l_5 | t |
|------|-------|----------------------|-------|-----|
| 1 | 2.5 | 2.3 | 1.4 | 0.5 |
| 2 | 3 | 2.6 | 1.6 | 0.7 |
| 3 | 3 | 3.1 | 2.1 | 0.7 |

Designation:

A needle holder of Type C, consisting of a needle holder bush of size 2 and needle holder screw of size 2, both made from nickel silver (Ns) and polished, shall be designated as follows:

Needle Holder C2 — 2 IS 3222 Ns Polished

5 WORKMANSHIP AND FINISH

5.1 Knurled nuts, T-bolts, threaded bushes, needle holders and centre screws shall be free from rust, cracks or burrs.

5.2 Knurled nuts, threaded bushes, needle holders and centre screws shall be finished as follows:

| Material | Finish |
|-------------------------|----------------------------------|
| Stainless steel (Ss) | Polished |
| Free-cutting steel (St) | Polished and nickelplated |
| Nickel silver (Ns) | Polished or chromium-plated |
| Phosphor bronze (Bz) | Nickel-plated or chromium plated |

5.3 T-bolts may be either plated with nickel chromium cadmium or phosphated as desired by the purchaser.

6 PERFORMANCE TEST

6.1 Drawing instrument shall not show any noticeable backlash after 1 000 screwing and unscrewing operations which may lead to visible drafting errors because of the instrument.

7 SAMPLING

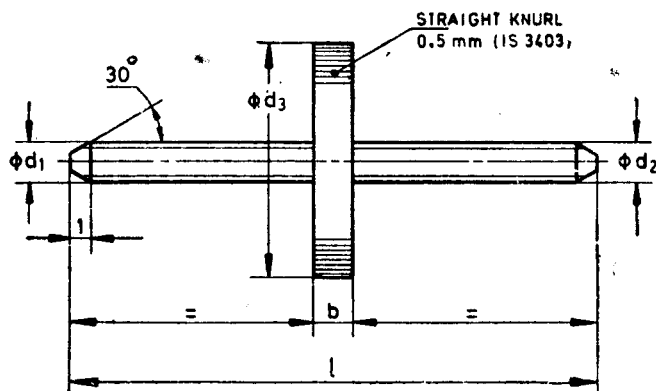
7.1 Sampling shall be taken at random by the purchaser or his authorised representative from each lot or batch as specified in IS 2614 : 1969.

7.2 The criteria for uniformity of a batch or lot with this standard shall be determined according to IS 2614 : 1969.

Table 6 Dimensions for Centre Screws

(Clause 4.5)

All dimensions in millimetres.



| d_1 | d_2 | l Approx | b Approx | d_3 Approx |
|--------------------------------|-----------------------------------|---------------|---------------|-----------------|
| M2 | M2 LH | 22 | 2 | 12 |
| M2 | M2 LH | 27 | 2 | 12 |
| M2 | M2 LH | 32 | 2 | 12 |
| M3 \times 1 (double start) | M3 \times 1 LH (double start) | 50 | 2.5 | 15 |
| M3 \times 1 (double start) | M3 \times 1 LH (double start) | 55 | 2.5 | 15 |

Designation:

A centre screw with threads M2 right-hand and M2 left-hand, having overall length $l = 27$ mm and centre nut made of nickel silver (Ns), and chromium-plated, shall be designated as:

Centre Screw M2 \times 27 IS 3222 Ns Chrome-plated

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Doc : No. LMD 20 (4961)

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